

**CAMERA LENS ASSEMBLY FOR PORTABLE WIRELESS TERMINALS**

**PRIORITY**

This application claims priority to an application entitled "CAMERA LENS ASSEMBLY FOR PORTABLE WIRELESS TERMINALS", filed in the Korean Intellectual  
5 Property Office on August 21, 2003 and assigned Serial No. 2003-57963, the contents of which are incorporated herein by reference.

**BACKGROUND OF THE INVENTION**

**1. Field of the Invention**

The present invention relates to a portable wireless terminal, and more particularly to a  
10 camera lens assembly for portable wireless terminals.

**2. Description of the Related Art**

Portable wireless terminals with various functions and shapes have been proposed as the information communication industry is developed. On the basis of their forms, the portable terminals may be classified into a bar-type terminal, a flip-type terminal having a flip cover, and  
15 a folder-type terminal having a folder part, which is rotatably attached to the main body of the terminal to move within the range of prescribed angles.

Such portable terminals have various functions, such as transmitting/receiving e-mails or data, playing Internet games, or transmitting text messages, in addition to a basic function,

i.e., an audio communication function. Still other functions of the portable terminals, such as image communication between users of the portable terminals or a motion picture service, have been increasingly expanded recently as the portable terminals adopt new communication technologies, such as CDMA 1x EVDO. As a mobile communication service area is increased,  
5 the portable wireless terminal is further provided with various functional units, such as a camera lens, which becomes especially indispensable as the image communication or the motion picture service using the portable wireless terminal is expanded.

Fig. 1 is a perspective view showing a portable wireless terminal 100 with a conventional camera lens assembly 200. As shown in Fig. 1, the conventional camera lens  
10 assembly 200 is mounted in one of side hinged arms 115 of the portable wireless terminal 100. The portable wireless terminal 100 comprises a main body 101 and a folder part 102 rotatably attached to the main body 101.

On the front surface of the main body 101 are arranged a keypad 111 comprising a plurality of key buttons, and a microphone unit 113, which is disposed at one side of the keypad  
15 111. At the upper right end of the main body 101 is attached an antenna unit 119.

The folder part 102 comprises a display unit 121 arranged on the inner surface thereof, which is opposite to the main body 101, and a speaker unit 123 disposed at one side of the display unit 121.

The main body 101 is provided at the upper end thereof with a pair of side hinged arms  
20 115, which are opposite to and spaced apart from each other. At one end of the folder part 102 is formed a center hinged arm 125, which is rotatably disposed between the side hinged arms 115. Consequently, the folder part 102 is rotatably attached to the main body 101. The camera

lens assembly 200 is rotatably mounted in one of the side hinged arms 115 of the main body 101.

Fig. 2 is an exploded perspective view of the camera lens assembly 200 of the portable wireless terminal 100 shown in Fig. 1. As shown in Fig. 2, the camera lens assembly 200  
5 comprises a lens housing 201, a front cover 202, a lens unit 203, a rear cover 204, and a camera shaft 205. As described above, the camera lens assembly is rotatably mounted in one of the side hinged arms 115 of the main body 101.

The lens housing 201 is formed in the shape of a cylinder having open ends. Inside the lens housing 201 may be mounted ribs (not shown) for supporting a camera lens. The front  
10 cover 202 is attached to one end of the lens housing 201. One end of the camera lens 231 is fixed to the inside of the front cover 202. The front cover 202 has an exposure opening 221 for exposing the camera lens 231. The exposure opening 221 is closed by means of a window 229 made of transparent material. The rear cover 204 is fixed to the other end of the lens housing 201 by means of a fixing member, such as a screw 269. From one side of the rear cover 204 is  
15 extended a coupling shaft having a grooved coupling part 249 formed at the end thereof. The rear cover 204 serves to close the other end of the lens housing 201. Also, the rear cover 204 provides a passage through which a flexible printed circuit 233 extended from one end of the camera lens 231 passes. The camera shaft 205 has a through-hole 251, through which the coupling shaft of the rear cover 204 is inserted. Consequently, the end of the rear cover 204,  
20 where the grooved coupling part 249 is formed, is protruded toward the end of the camera shaft 205. The end of the rear cover 204 is inserted through a diaphragm (not shown) disposed in one of the side hinged arms 115 so that an E-ring 263 is fitted on the grooved coupling part 249 of the rear cover 204. In this way, the camera lens assembly 200 is rotatably mounted in one of the side hinged arms 115.

Between the rear cover 204 and the camera shaft 205 is disposed a spring washer 261, which serves to tightly push the camera shaft 205 to the diaphragm in the side hinged arm 115. Consequently, the camera lens assembly 200 is rotated while the E-ring 263 and the end of the camera shaft 205 are tightly pushed to both sides of the diaphragm, respectively, so that the  
5 camera lens assembly 200 is stably rotatable.

The camera lens assembly 200 of the portable terminal 100 with the above-stated construction is rotated about a rotating axis A extended in the lateral direction of the main body 101. As a result, it is possible to take pictures using the camera lens assembly 200 while it is turned toward the front or the rear of the main body 101.

10 In the conventional camera lens assembly, however, the lens housing can be rotated about only one rotating axis, and picture-taking angles are limited within the rotation track of the lens housing. Consequently, the conventional camera lens assembly has a problem that a picture-taking operation in the lateral direction is difficult and inconvenient although the picture-taking operation in the forward and backward direction is easy.

## 15 SUMMARY OF THE INVENTION

Therefore, the present invention has been made in view of the above problem, and it is an object of the present invention to provide a camera lens assembly for portable wireless terminals comprising lens housings rotatable about two rotating axes, respectively, to provide a picture-taking operation that can be effectively carried out in various directions.

20 In accordance with one aspect of the present invention, the above and other

objects can be accomplished by a camera lens assembly mounted in a portable wireless terminal and comprising: a first lens housing rotatably attached to the terminal so that the first lens housing can be rotated about a first rotating axis extended in one direction; and a second lens housing rotatably attached to one end of the first lens housing so that the second lens housing  
5 can be rotated about a second rotating axis extended perpendicularly to the first rotating axis, the second lens housing having a camera lens mounted therein.

### BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with  
10 the accompanying drawings, in which:

Fig. 1 is a perspective view showing a portable wireless terminal with a conventional camera lens assembly;

Fig. 2 is an exploded perspective view of the camera lens assembly of the portable wireless terminal shown in Fig. 1;

15 Fig. 3 is an exploded perspective view showing a camera lens assembly for portable wireless terminals according to a preferred embodiment of the present invention;

Fig. 4 is an assembled perspective view of the camera lens assembly shown in Fig. 3;

Fig. 5 is a front view of the camera lens assembly shown in Fig. 4;

Fig. 6 is a side view of the camera lens assembly shown in Fig. 4;

20 Fig. 7 is another front view of the camera lens assembly shown in Fig. 4;

Fig. 8 is another side view of the camera lens assembly shown in Fig. 4; and

Fig. 9 is a perspective view of a portable wireless terminal with the camera lens assembly shown in Fig. 3 mounted therein:

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Now, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. In the following, a detailed description of known functions and configurations incorporated herein will be omitted, when it may make the subject  
5 matter of the present invention rather unclear.

Referring to Figs. 3 to 8, a camera lens assembly 300 for portable wireless terminals, such as a portable wireless terminal 400 shown in Fig. 9, according to a preferred embodiment of the present invention comprises a first lens housing 301, a second lens housing 302, a camera lens unit 303, a rear cover 304, and a camera shaft 305.

10 The first lens housing 301, shaped as a cylinder, has opposite opened ends defining therebetween a receiving space 311. The first lens housing 301 is provided at one end thereof with a first semicircular opening 313 and a pair of supporting pieces 315. The supporting pieces 315 extend from the end of the first lens housing 301 in the longitudinal direction of the first lens housing 301 and are spaced diametrically apart from one another. The first  
15 semicircular opening 313 is spaced angularly from both supporting pieces 315 at a prescribed distance. On the opposite surfaces of the supporting pieces 315 are formed a supporting hole (not shown), respectively. The first lens housing 301 is rotatably mounted in a main body 401 of the portable wireless terminal 400 through the rear cover 304 and the camera shaft 305 so that the first lens housing 301 can be rotated about a first rotating axis A1 extended in the  
20 longitudinal direction of the first lens housing 301.

From one side of the rear cover 304 is extended a coupling shaft having a grooved coupling part 349 formed at the end thereof. The rear cover 304 is fixed to the other end of the

first lens housing 301 by means of a fixing member, such as a screw 369, for closing the other end of the first lens housing 301. Also, the rear cover 304 provides a passage through which a flexible printed circuit 333, extended from one end of the camera lens 331, passes. The camera shaft 305 has a through-hole 351, through which the coupling shaft of the rear cover 304 is  
5 inserted. Consequently, the end of the rear cover 304, where the grooved coupling part 349 is formed, is protruded toward the end of the camera shaft 305. The end of the rear cover 304 is inserted through a diaphragm (not shown) disposed in one of the side hinged arms 415 of the main body 401 so that an E-ring 363 is fitted on the grooved coupling part 349 of the coupling shaft of the rear cover 304. In this way, the camera lens assembly 300 is rotatably mounted in  
10 one of the side hinged arms 415.

Between the rear cover 304 and the camera shaft 305 is disposed a spring washer 361, which serves to tightly push the camera shaft 305 to the diaphragm in the side hinged arm 415. Consequently, the camera lens assembly 300 is rotated while the E-ring 363 and the end of the camera shaft 305 are tightly pushed to both sides of the diaphragm, respectively, so that the  
15 camera lens assembly 300 is stably rotatable.

The rear cover 304 may be formed integrally with the camera shaft 305. In this case, the spring washer 361 may be disposed adjacent to the grooved coupling part 349 so that the spring washer 361 can be placed against the diaphragm in the side hinged arm 415.

The second lens housing 302 is rotatably attached to one end of the first lens housing  
20 301 so that the second lens housing 302 can be rotated about a second rotating axis A2, which is extended perpendicularly to the first rotating axis A1. The second lens housing 302 comprises a first hemispheric case 302a opposite to the first lens housing 301, and a second hemispheric case 302b attached to the first hemispheric case 302a. Consequently, the first and

second hemispheric cases 302a and 302b together constitute the second lens housing 302, which is formed in the shape of a sphere. The first and second hemispheric cases 302a and 302b have a receiving space 323 defined by ribs formed therein. In the receiving space 323 is disposed a camera lens 331 of the camera lens unit 303. The second lens housing, which  
5 comprises the first and second hemispheric cases 302a and 302b, is provided at a prescribed position of the outer circumference thereof with a second opening 321a for exposing the camera lens 331. Preferably, the second opening 321a is closed by a window 321b made of a transparent material. As the second lens housing 302 is rotated, the second opening 321a can be placed above the first semicircular opening 313 of the first lens housing 301. Specifically,  
10 the second opening 321b comprises a semicircular opening part formed at the first hemispheric case 302a and another semicircular opening part formed at the second hemispheric case 302b. Also, the second lens housing 302 is provided at the outer circumferential surface thereof with a pair of pinholes 325, which are opposite to each other. As in the second opening 321a, each pinhole 325 may comprise pinhole parts formed at the first and second hemispheric cases 302a  
15 and 302b, respectively. Through the pinholes 325 are inserted supporting pins 329, respectively. The one end of each of the supporting pins 329 is protruded out of the second lens housing 302. Preferably, the supporting pins 329 are rotatably inserted through the corresponding pinholes 325. Alternatively, the supporting pins 329 may be formed integrally at the outer circumferential surface of the second lens housing 302. The supporting pins 329  
20 are rotatably inserted into the supporting holes formed at the supporting pieces 315 of the first lens housing 301, respectively. Consequently, the second lens housing 302 can be rotated about the supporting pins 329 coinciding with the second rotating axis A2.

On the outer circumferential surface of the second lens housing 302 may be formed a protrusion for restricting the rotation range of the second lens housing 302. For example, on  
25 the outer circumferential surface of the second hemispheric case 302b is formed a stopper

protrusion 327, which is extended along the line connecting two pinholes 325. When the second lens housing 302 is rotated, the stopper protrusion 327 is engaged with the end of the first lens housing 301 for restricting the rotation range of the second lens housing 302. As another example of means for restricting the rotation range of the second lens housing 302, there may be provided a guide rib (not shown) protruded along the edge of the second opening 321a. The guide rib may serve to securely attach the window 321b to the second housing 302 at the second opening 321a. When the second opening 321a is placed above the first semicircular opening 313, the guide rib is engaged with the sidewall of the first semicircular opening 313 for restricting the rotation range of the second lens housing 302.

Although it is not shown in the drawings, the first hemispheric case 302a of the second lens housing 302 preferably has a through-hole through which the flexible printed circuit 333 of the camera lens unit 303 passes. The flexible printed circuit 333 passes through the through-hole and the first lens housing 301 and are drawn out from the other end of the first lens housing 301. Since the rotation range of the second lens housing 302 is restricted by means of the stopper protrusion 327, the through-hole formed at the first hemispheric case 302a of the second lens housing 302 is preferably placed in the first lens housing 301. It can be seen from Figs. 5 to 8 that the rotation range of the second lens housing 302 is limited to an angle of 90 degrees by means of the stopper protrusion 327. In other words, when the second lens housing 302 is rotated by an angle of 90 degrees about the second rotating axis A2 under the condition that the second opening 321a is placed above the first opening 313, the stopper protrusion 327 is engaged with the end of the first lens housing 301, by which the second lens housing is no longer rotated. Also, since the guide rib is formed along the edge of the second opening 321a as described above, the movement of the second opening 321a to the inside of the first lens housing 301 can be restricted.

Fig. 9 is a perspective view showing the portable wireless terminal 400 with the camera lens assembly 300 mounted therein. As shown in Fig. 9, the camera lens assembly 300 is rotatably mounted in the main body 401 of the portable wireless terminal 400. More specifically, the camera lens assembly 300 is mounted in one of the side hinged arms 415 of the  
5 main body 401 of the portable wireless terminal 400.

On the front surface of the main body 401 are arranged a keypad 411 comprising a plurality of key buttons, and a microphone unit 413, which is disposed at one side of the keypad 411. At the upper right end of the main body 401 is attached an antenna unit 419. The side hinged arms 415 are formed at the upper end of the main body 401 in a pair, which are opposite  
10 to each other while being spaced apart from each other.

A folder part 402 of the portable wireless terminal 400 comprises a display unit 421 arranged on the surface thereof, which is opposite to the main body 401, and a speaker unit 423 disposed at one side of the display unit 421. At one end of the folder part 402 is formed a center hinged arm 425, which is rotatably disposed between the side hinged arms 415.

The camera lens assembly 300 is attached to one end of one of the side hinged arms 415. As the first lens housing 301 is rotated about the first rotating axis A1, the second opening 321a is turned toward the front or the rear of the terminal 400 so that a picture of a subject can be taken in the front or at the rear of the portable wireless terminal 400. As the second lens housing 302 is rotated about the second rotating axis A2, the second opening 321a is turned in the lateral direction of the portable wireless terminal 400 so that a picture of a subject can be taken in the lateral direction of this terminal 400. The second lens housing 302 can be independently rotated irrespective of the rotation of the first lens housing 301. Consequently, it is possible to individually adjust rotation angles of the first and second lens housing 301 and

302, respectively, so that a picture-taking operation can be carried out in the oblique direction as well as the aforesaid forward, backward, and lateral directions.

As apparent from the above description, the present invention provides a camera lens assembly for portable wireless terminals wherein a camera lens can be independently rotated about two rotating axes, whereby a picture-taking operation can be effectively carried out in various directions. Consequently, a picture of a subject can be conveniently taken using the camera lens assembly mounted in the portable wireless terminal.

Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.